WHAT IS CLAIMED IS:

1. A probe carrier, characterized by comprising a single-stranded DNA probe immobilized to a carrier having a thin film containing (111)-oriented single crystal gold formed thereon through a sulfur atom.

2. A probe carrier according to claim 1, wherein surface unevennesses of the thin film containing (111)-oriented single crystal gold are 0.5 nm or less per μm^2.

3. A probe carrier according to claim 1, wherein the sulfur atom interposed between the carrier and the single-stranded DNA probe is formed as a functional group of the single-stranded DNA probe.

4. A probe carrier according to claim 1, wherein the single-stranded DNA probe has a thiol group as a functional group.

5. A probe carrier according to claim 1, wherein an ink jet method is used to apply the single-stranded DNA probe to the carrier upon immobilizing the single-stranded DNA probe to the carrier.

6. A probe carrier according to claim 1, wherein a method in which the carrier is immersed in a gold complex solution to form a gold single crystal thin film on the carrier is used as a method of forming the thin film containing the (111)-oriented single crystal gold.

7. A probe carrier according to claim 1, wherein the thin film containing the (111)-oriented single crystal gold is used as an electrode.

8. A probe carrier according to claim 1, wherein the thin film containing the (111)-oriented single crystal gold can be applied with a voltage.

9. A method of producing a probe carrier having a single-stranded DNA probe immobilized to a carrier having a thin film containing (111)-oriented single crystal gold formed thereon through a sulfur atom, the method comprising the steps of:

forming the thin film containing (111)-oriented single crystal gold on the carrier; and

immobilizing the single-stranded DNA probe to the thin film through the sulfur atom.

10. A method of producing a probe carrier according to claim 9, wherein surface unevennesses of

the thin film containing the (111)-oriented single crystal gold are 0.5 nm or less per μm^2.

11. A method of producing a probe carrier according to claim 9, wherein the sulfur atom interposed between the carrier and the single-stranded DNA probe is formed as a functional group of the single-stranded DNA probe.

12. A method of producing a probe carrier according to claim 9, wherein an ink jet method is used to apply the single-stranded DNA probe to the carrier upon immobilizing the single-stranded DNA probe to the carrier.

13. A method of producing a probe carrier according to claim 9, wherein the method in which a carrier is immersed in a gold complex solution to form a gold single crystal thin film on the carrier is used as a method of forming the thin film containing the (111)-oriented single crystal gold.

14. A method of producing a probe carrier according to claim 9, wherein the thin film containing the (111)-oriented single crystal gold comprises a patterned gold single crystal film.

15. A method of producing a probe carrier according to claim 14, wherein an electron beam or ion is applied to the carrier for the patterning.

16. A method of evaluating a probe carrier, characterized by comprising observing and inspecting a form of the probe carrier produced by the method according to claim 9 through a scanning probe microscope.

17. A method of detecting a target nucleic acid using a probe carrier having a single-stranded DNA probe for the detection of the target nucleic acid, characterized in that the probe carrier is the probe carrier of any one of claims 1 to 8.

18. A method of detecting a target nucleic acid according to claim 17, wherein the thin film containing the (111)-oriented single crystal gold is used as an electrode and the target nucleic acid is detected by electrochemical measurement using the electrode.

19. A molecular device manufactured by using a thin film containing (111)-oriented single crystal gold as electrodes and interconnecting the electrodes by using a molecular chain typified by DNA.